

**CHICAGO POWER  
ELECTRIC® SYSTEMS**

# 45 WATT SOLAR KIT

**Model 90599**

## INSTALLATION AND SERVICE INSTRUCTIONS



Visit our website at: <http://www.harborfreight.com>



**Read this material before using this product.  
Failure to do so can result in serious injury.  
SAVE THIS MANUAL.**

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**For technical questions or replacement parts, please call 1-800-444-3353.**

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## SAVE THIS MANUAL

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Keep this manual for the safety warnings and precautions, installation, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

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## IMPORTANT SAFETY INFORMATION

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In this manual, on the labeling, and all other information provided with this product:



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### **CAUTION**

**CAUTION**, used with the safety alert symbol, indicates a hazardous situation which, if

not avoided, could result in minor or moderate injury.

### **NOTICE**

**NOTICE** is used to address practices not related to personal injury.

### **CAUTION**

**CAUTION**, without the safety alert symbol, is used to address practices not related to personal injury.



**WARNING** Read all safety warnings and instructions.

*Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury.*

**Save all warnings and instructions for future reference.**

The warnings, precautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

### Installation Precautions

1. **Exercise special caution if working on roof or another high location.** Keep proper footing and balance at all times. Follow ladder supplier's precautions whenever working near or on a ladder.
2. **Install all sensitive electrical components (including wiring connections, regulator, and battery) inside a weatherproof enclosure to prevent electric shock.**

3. **Do not wire multiple panels in series.** If you need to connect two or more solar panels together, this work must be done by a qualified electrician unless they are connected through a regulator.
4. This solar panel kit is not designed for tie-in to a grid. Only a licensed electrician and a licensed building contractor can safely design and implement a grid tie-in system. Any grid tie-in system must meet all applicable building and electrical codes, and must meet standards established by the area power company. Improper grid tie-in can result in electrocution, fire, and other serious personal injury and property damage. An incorrectly installed grid tie-in system can cause feedback voltage, resulting in electrocution of electrical utility workers.
5. **Do not stand on or otherwise apply pressure to panel.**
6. **Handle solar panel with care, edges may be sharp.**
7. **Do not focus light on panel.**
8. **Install components with enough space to allow proper cooling.**
9. **This product may occasionally produce more current and/or voltage than its rated output. Increase output ratings by 25% when determining component required voltage and amperage ratings.** Refer to Section 690-8 of the National Electrical Code for an additional multiplying factor of 125 percent (80 percent derating) which may apply.

10. Panel must be connected using UL listed outdoor rated wire of the correct thickness (gauge) for the amperage rating and length (see warning number 9 also). Follow the guidelines in the chart below:

Current in Amps	Maximum Length				
	5'	10'	15'	20'	25'
0-5	18				
6-7	18				16
8	18			16	
10	18		16		
11-12			16		14
15			14		12
18	18	16	14		10
20			14	12	
22-24			12		
30	16	14	10		
40					
50	14	12	10		8
100	12	10	6		4
150	10	8	4		2
200	8	6			

**Minimum Wire Gauge**

11. Install an appropriate charge controller/regulator to regulate output and prevent damage. Do not attach panel to battery or power grid without proper regulator, inverter, and/or charge controller.
12. Install and use according to applicable National Electrical Code (NEC) standards.
13. This panel is not rated for use as fire-resistant roofing. If installing on a roof, install only over a fire resistant roof covering rated for the application.
14. Verify that installation surface has no hidden utility lines before drilling or driving screws.
15. Install only according to these instructions. Improper installation can create hazards.

16. Wear ANSI-approved safety goggles and heavy-duty work gloves during installation. Do not wear jewelry or metal watches when working near solar panels, wiring or batteries.
17. Handle panel with care. Glass may break or a sharp edge may be exposed during movement.
18. Keep installation area clean and well lit.
19. Install out of reach of children.
20. Keep bystanders out of the area during installation.
21. Do not install when tired or when under the influence of drugs or medication.
22. Use in 12 VDC systems only.

### **Battery Precautions**

23. **Wear splash-resistant ANSI-approved safety goggles and electrically insulated gloves while working near batteries.**
24. **Use an appropriate charge controller whenever connected to battery.**
25. Charge, store, and maintain batteries according to supplier's instructions.

### **Service Precautions**

1. **Before service, maintenance, or cleaning:**
  - a. **Dry solar panels and outdoor wiring thoroughly while wearing electrically insulated gloves.**
  - b. **Cover all solar panels with an opaque cover, such as a blanket.**
  - c. **Disconnect all solar panels.**
  - d. **Disconnect all batteries.**
2. **Do not service during rain, fog, or any other wet/humid weather.**
3. **Do not stand on or otherwise apply pressure to panel.**
4. Do not allow children to play with or near this item or electrical components.
5. Inspect at least monthly; do not use if damaged, parts are loose, water is found inside the housing, electrical insulation is cracked or damaged, or connections are loose.
6. Maintain product labels and nameplates. These carry important safety information. If unreadable or missing, contact Harbor Freight Tools for a replacement.
7. **WARNING: Handling the cord on this product will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. Wash hands after handling. (California Health & Safety Code § 25249.5, *et seq.*)**



**SAVE THESE  
INSTRUCTIONS.**

## SPECIFICATIONS

Rated Output	14.5 V~ / 15 W (working)
Open Circuit Voltage	23.5 OCV
Adapter Outlets	3, 6, 9 and 12 VDC

**Note:** Output will decrease as the panel gets hotter than room temperature (~70° F). Angle, solar intensity, cloud cover and other factors will effect output

## UNPACKING

When unpacking, make sure that the item is intact and undamaged. If any parts are missing or broken, please call Harbor Freight Tools at 1-800-444-3353 as soon as possible.

## INSTALLATION



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

**Note:** For additional information regarding the parts listed in the following pages, refer to the Assembly Diagram near the end of this manual.

### Location

1. Locate the panel where it will receive full, unobstructed sunlight, especially during midday. Nearby trees or tall plants will drop debris, requiring the panel to be cleaned more frequently.
2. The installation location for the panels, charge controller/regulator, and batteries must be inaccessible

to children to prevent electric shock. Build a childproof enclosure if needed.

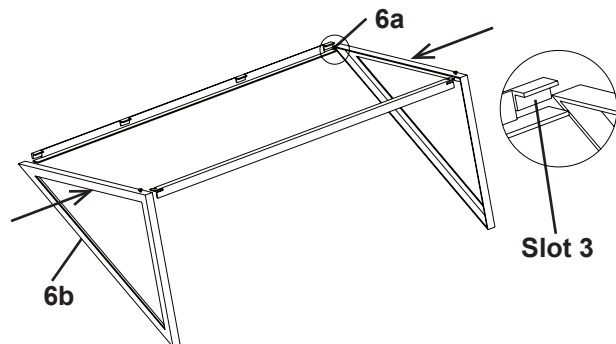
3. Install the charge controller/regulator and batteries in a weatherproof enclosure with proper ventilation.

### Mounting

1. Angle the face of the panel toward true south<sup>1</sup> according to the chart that follows:

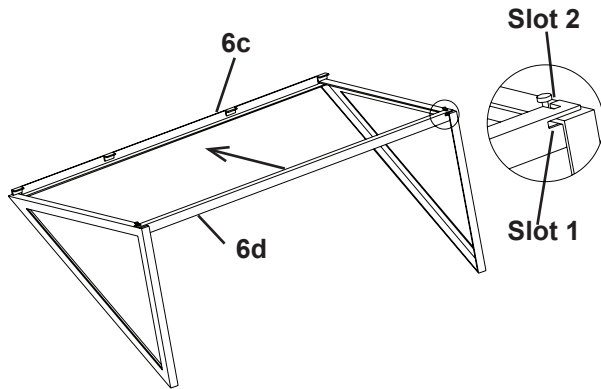
Latitude	Solar Panel Angle
0-4°	10°
5-20°	Latitude + 5°
21-45°	Latitude + 10°
46-64°	Latitude + 15°
65° or more	80°

## ASSEMBLY



1. Slide the Left and Right Triangle Frame (6a and 6b) into slot 1 and slot 3 on both ends of the Top Link Bar (6d) and Bottom Link Bar (6c) (to form the frame assembly). See above.

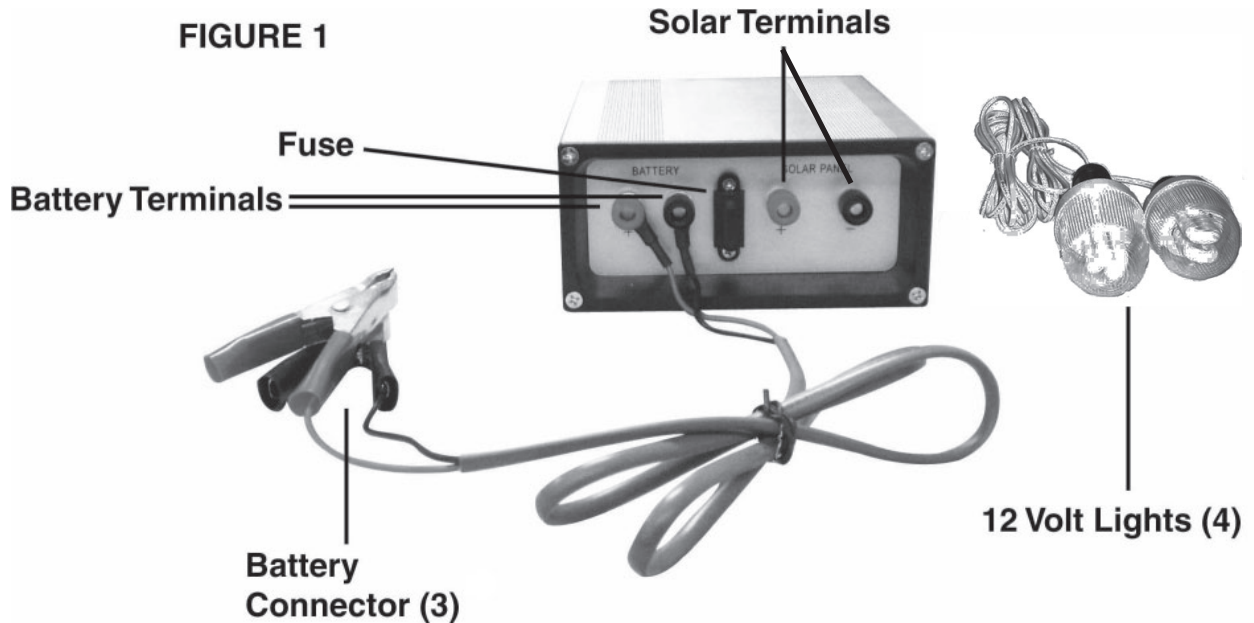
<sup>1</sup> Angle towards true north if installed in southern hemisphere.



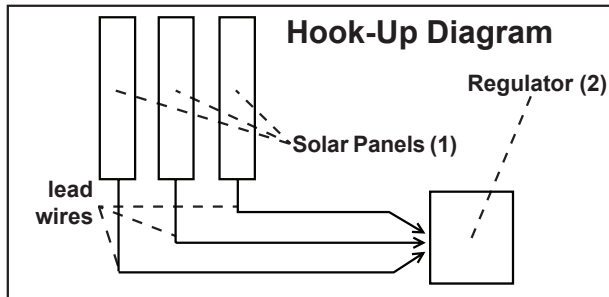
2. Push the Top Link Bar (6d) down to slot 2 (to lock the frame assembly). See above.
3. Determine where you want to position the **Frame Assembly (6a-6d)** making sure it is facing south (for maximum sun exposure) with no obstructions in front of it. The **Regulator (2)** must be in a dry, well ventilated location nearby. If necessary, build a small structure that guarantees the unit will stay dry during rain or snow, and,

- provide enough ventilation to allow the unit to vent and cool properly.
4. Secure the **Frame Assembly (6a-6d)** to its mounting location using hardware (not supplied) through the four holes on the bottom of the **Left and Right Triangle Frames (6a & 6b)**.
  5. Carefully place each **Solar Panel (1)** on the front of the **Frame Assembly (6a-6d)** so that the bottom of each panel fits into the slot on the bottom of the **Frame Assembly (6a-6d)**.
  6. Lock the two eye hooks on the back-center frame into the two protruding bolts on the **Top Link Bar (6d)**.

**CAUTION:** If the unit is to be mounted on a rooftop, be especially careful when climbing ladders and walking on sloped roofs. Additional hardware may have to be purchased if



permanently mounting the Solar panels on a rooftop.



7. Connect the two ring connectors at the end of the lead wires coming from the **Solar Panels (1)** to the Solar Terminals on the **Regulator (2)**. See **FIGURE 1**. Be sure to connect by matching polarities on the wires and the **Regulator (2)**. Black (-) is negative and red (+) is positive. Then, connect the wire leads so that all of the **Solar Panels (1)** are connected to each other and the **Regulator (2)** (again, making sure you are hooking up to the right polarity on the Regulator). See **Hook-Up Diagram**, above.

### Wiring

**Note:** Only a licensed electrician and a licensed building contractor can safely design and implement a grid tie-in system. Any grid tie-in system must meet all applicable building and electrical codes, and must meet standards established by the area power company.

1. Run wires from the panels, through weatherproof grommets and into the enclosure where the charge controller/regulator is located. Use wires of the proper size and rating.
2. Connect to charge controller/regulator according to controller/regulator's instructions.

3. Secure all connections using terminals, or solder all wire splices to ensure good connections.
4. Weatherproof all connections.

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## **OPERATION**

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**Note:** Performance of the Solar Panels will vary dependent on site location, angle of the panels in relation to the arc of the sun, and available sunlight.

### Recharging a Battery

1. To recharge a 12 volt battery (not included), while paying attention to the proper polarity (black (-) is negative and red (+) is positive), connect the two ring terminals on the **Battery Connector (3)** to the Battery Terminals on the back of the **Regulator (2)**. See **FIGURE 1**. Then, connect the black clamp to the black or negative (-) terminal on the battery (not included). Finally, connect the red clamp to the red or positive (+) terminal on the battery. Avoid accidental contact of the red and black battery clamps to each other.

**Note:** Do not change the order explained in number 1 above or electric shock resulting in serious injury or death may occur.

2. Turn on the Regulator. See the On/Off switch in **FIGURE 1** on page 6.
3. Never leave the battery (not included) unattended while charging. When the battery (not included) is fully charged, the reading on the voltage display will show "13" or above. Note: the voltage display will have to be turned on in order to monitor the

batter voltage. (It is recommended to leave the voltage display off when not monitoring the battery voltage since it consumes energy.) Twelve (12) Volt batteries should charge to 13 Volts for a full charge. If the intent is to stop charging the battery, disconnect the solar panels from the charge regulator. Note: The charge regulator provides “over charge” protection. If the battery voltage is higher than 14.5 V, the regulator will shut off charge from solar panel.

4. The **Regulator (2)** provides the following protection while charging:
  - a. **Over-discharge Protection:** When the electricity level of the battery (not included) goes too low (below 11 volts) the **Regulator (2)** will automatically shut off the power output to prevent damage to the battery (not included). If this occurs, stop using the battery (not included) and charge it until the Voltage display shows 13 volts.
  - b. **Overcharge Protection:** If the electricity level on the battery (not included) goes too high (above 14.5 volts) the **Regulator (2)** will automatically shut off power input to prevent damage to the battery (not included).
  - c. **Overload Protection:** If the output current exceeds 4 amps the fuse (See **FIGURE 1**) will blow to prevent damage to the controller in the **Regulator (2)**. If this occurs, have a qualified service technician replace the fuse.

**Note:** The On/Off switch of the charge regulator must be in the “On” position to activate the three protection functions mentioned above.

## Using the 12 Volt Lights and Accessories.

**Note:** The Charge Regulator must be in “ON” position at all times.

1. If the **12 Volt Lights (4)** aren’t already attached to the sockets on the end of each **Light Wire (7)**, gently snap them in.
2. Plug the other end of the **Light Wire (7)** into any one of the 12 Volt DC outlets on the **Regulator (2)** as shown in **FIGURE 2**.

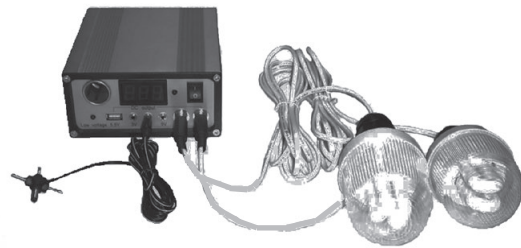
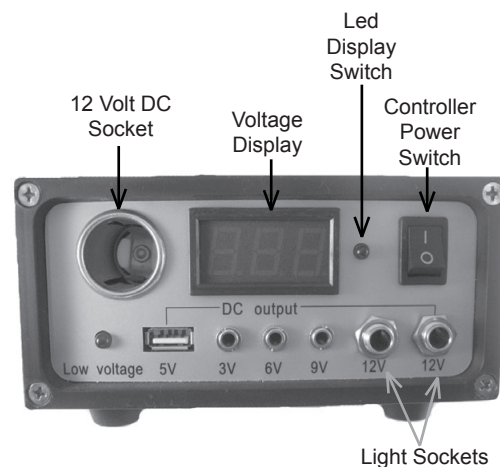


Figure 2



3. To turn off the lights, unplug the **Light Wire (7)** from the 12 Volt DC outlet on the **Regulator (2)**. You may plug in the other **12 Volt Light (4)** to either 12 Volt DC outlet.

**Note:** This system can also be used to power other small 3 Volt DC, 6 Volt DC, and 9 Volt DC small appliances.



4. Plug the appropriate plug on the **Multi Purpose Adapter (5)** into the appliance. The adapter has 3 Volt DC, 5 Volt DC, 6 Volt DC, 9 Volt DC, and 12 Volt DC plugs.
5. Insert the plug on the other end of the wire attached to the **Multi Purpose Adapter (5)** into the appropriate DC Outlet on the **Regulator (2)**. For your reference, **FIGURE 2** shows the adapter wire plugged into the 3 Volt DC outlet.
6. Operate your appliance.
7. When finished, unplug the **Multi Purpose Adapter (5)** wire plug from the **Regulator (2)** and then unplug the **Multi Purpose Adapter (5)** from the appliance.

**TO PREVENT SERIOUS INJURY FROM ELECTRIC SHOCK OR CUTS:**  
**Do not use damaged solar panel. If wiring insulation is damaged or weathered, glass is cracked, or housing is opened, have the problem corrected before further use.**

**Note:** It is normal to see up to 20% degradation in amorphous silicon solar panel performance within the first 6 months before the amorphous coating stabilizes.

### Cleaning

Clean and inspect the solar panel system **MONTHLY**, or more frequently to maintain peak efficiency:

1. **Wear electrically insulated gloves and ANSI-approved safety goggles.** Dry solar panels and outdoor wiring thoroughly.
2. **Cover all solar panels with an opaque cover, such as a blanket.**
3. **Disconnect all solar panels and batteries.**
4. Clean solar panels one at a time with mild, non-abrasive cleanser and soft cloth and paper towels. Do not clean with brushes or abrasive cleaners.
5. Inspect the general condition of the solar panel system (panels, batteries, controllers, and mounting). Check for loose hardware, wiring insulation damage or weathering, cracked glass, open housing, cracked or broken parts, loose or corroded contacts, and any other condition that may affect its safe operation.

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## SERVICING

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**Procedures not specifically explained in this manual must be performed only by a qualified technician.**

### **⚠️ WARNING**

#### **TO PREVENT SERIOUS INJURY**



**FROM ELECTRIC SHOCK:**  
**Before service, maintenance, or cleaning:**

- a. **Dry solar panels and outdoor wiring thoroughly while wearing electrically insulated gloves.**
- b. **Cover all solar panels with an opaque cover, such as a blanket.**
- c. **Disconnect all solar panels.**
- d. **Disconnect all batteries.**

6. Inspect and maintain batteries according to supplier's instructions.

### **Adjustment**

#### **To Increase Efficiency:**

7. **In the Winter**, increase the panel's angle by 10°.
8. **In the Summer**, decrease the angle by up to 10°.
9. **In the Spring and Fall**, keep the panel at the angle recommended on the chart on page 9.

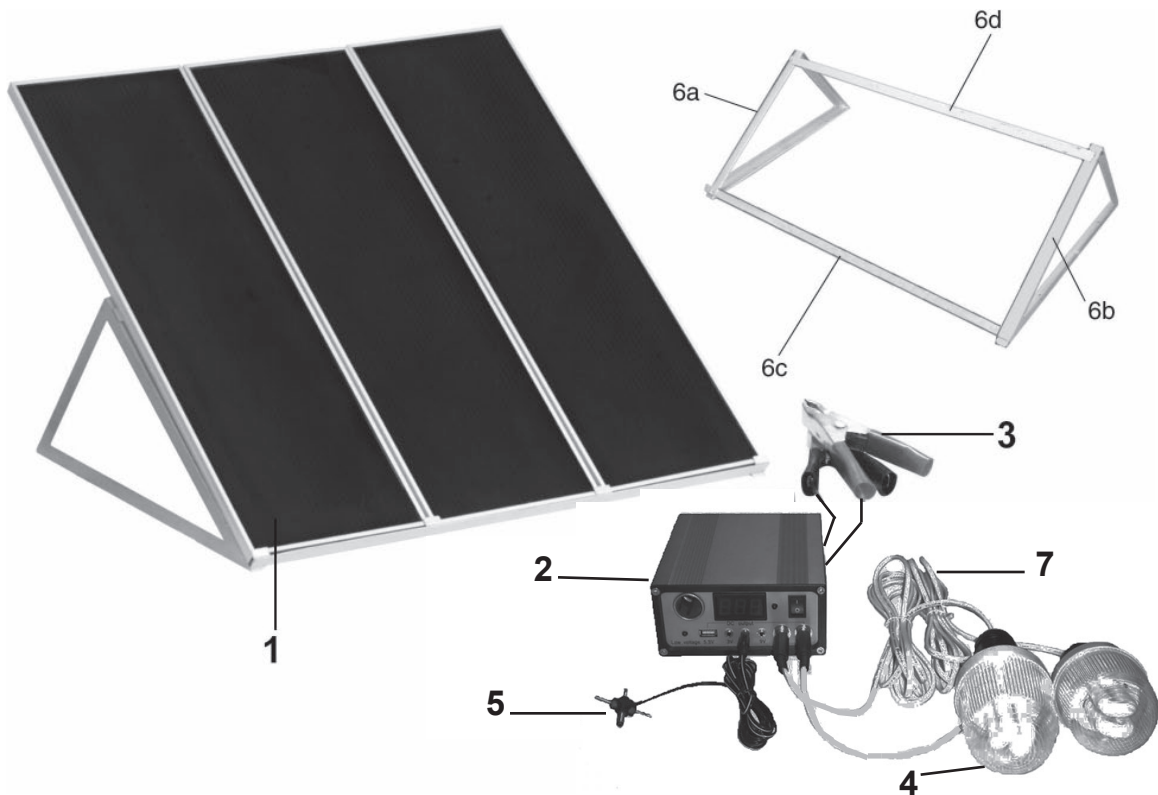
**PLEASE READ THE FOLLOWING CAREFULLY**

THE MANUFACTURER AND/OR DISTRIBUTOR HAS PROVIDED THE PARTS LIST AND ASSEMBLY DIAGRAM IN THIS MANUAL AS A REFERENCE TOOL ONLY. NEITHER THE MANUFACTURER OR DISTRIBUTOR MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND TO THE BUYER THAT HE OR SHE IS QUALIFIED TO MAKE ANY REPAIRS TO THE PRODUCT, OR THAT HE OR SHE IS QUALIFIED TO REPLACE ANY PARTS OF THE PRODUCT. IN FACT, THE MANUFACTURER AND/OR DISTRIBUTOR EXPRESSLY STATES THAT ALL REPAIRS AND PARTS REPLACEMENTS SHOULD BE UNDERTAKEN BY CERTIFIED AND LICENSED TECHNICIANS, AND NOT BY THE BUYER. THE BUYER ASSUMES ALL RISK AND LIABILITY ARISING OUT OF HIS OR HER REPAIRS TO THE ORIGINAL PRODUCT OR REPLACEMENT PARTS THERETO, OR ARISING OUT OF HIS OR HER INSTALLATION OF REPLACEMENT PARTS THERETO.

**PARTS LIST AND ASSEMBLY DIAGRAM**

Part	Description	Q'ty
1	Solar Panel	3
2	Regulator	1
3	Battery Connector	1
4	12 Volt Light	2
5	Multi-purpose Adapter	1

Part	Description	Q'ty
6a	Left Triangle Frame	1
6b	Right Triangle Frame	1
6c	Bottom Link Bar	1
6d	Top Link Bar	1
7	Light Wire	2



**Record Product's Serial Number Here:** \_\_\_\_\_

**Note:** If product has no serial number, record month and year of purchase instead.

**Note:** Some parts are listed and shown for illustration purposes only, and are not available individually as replacement parts.